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## Self-reported quality of life in users and nonusers of dietary supplements in cancer

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**Abstract** *Goals of work:* To describe the Quality of Life (QoL) characteristics of users of dietary supplements vs nonusers. *Patients and methods:* A survey of 225 cancer patients presenting for treatment at Cancer Treatment Centers of America was completed between November 2001 and October 2003. A validated instrument assessed the use of 56 dietary supplements in the past month. Two validated questionnaires assessed QoL. Mean QoL scores were compared between the users and nonusers using univariate and multivariate linear regression. *Results:* Of 225 patients, 91 (40%) were males and 134 (60%) females. Sixty seven (30%) had breast cancer, 40 (18%) colorectal cancer, and 32 (14%) lung cancer. One hundred sixty four (73%) had used dietary supplements in the past month, while 61 (27%) had not. Mean European Organization for Research Treatment of Cancer QoL scores were significantly better among the users for physical and emotional function scales and fatigue, nausea, appetite loss, and constipation symptom scales adjusting for tumor

site. In the stratified analysis, lung cancer patients did not show any statistically significant differences in QoL scores between the users and nonusers. Colorectal cancer patients demonstrated statistically significant differences in constipation symptom, with dietary supplement users having better QoL. Breast cancer patients demonstrated statistically significant differences in several QoL scale scores between users and nonusers. *Conclusions:* Contrary to some of the previously published research, this study, conducted at a community hospital comprehensive cancer center that combines alternative treatment approaches with conventional cancer care, found better self-reported QoL among the users of dietary supplements, as compared to nonusers. The next step in this research is to prospectively evaluate the patterns of changing QoL in relation to dietary supplement use across the entire duration of cancer diagnosis and treatment.

**Keywords** Dietary supplements · Quality of life · Cancer

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### Introduction

The use of complementary and alternative medicine (CAM) has been increasing in the US general population [1–3], with 67.6% of the population using at least one form of CAM in their lifetime [3]. Within the general population statistics are cancer patients who also utilize CAM ther-

apies. In a review by Ernst and Cassileth [4], 26 different cross-sectional studies reported that 7 to 64% of cancer patients used some form of CAM, with the average prevalence of 31.4% across all studies. Dietary supplements, which include vitamins, minerals, and herbs, are among the most commonly used CAM therapies. In four recent surveys of cancer patients, dietary supplement use

was the highest ranked CAM therapy, with 47 to 65% of cancer patients using vitamin therapy and 25 to 44% using herbs [5–8]. Patterson et al. (2002) described the use of dietary supplements by cancer site in patients who were diagnosed within the past 12 months and found that 79.4% of patients with breast cancer, 56.9% with colorectal cancer, and 56.1% with prostate cancer used one or more dietary supplements [7]. A more recent study published by our research group found a dietary supplement prevalence rate of 73.1% in 227 new adult cancer patients seen at a community hospital comprehensive cancer center [9].

Quality of life has emerged as one of the most commonly cited reasons for using dietary supplements and other CAM treatments [7, 8, 10]. Patterson et al. (2002) found that 95% of a total of 356 cancer patients were taking vitamins and minerals for general health and well-being and 88.1% for improved well-being; likewise, 87.5% were taking herbal agents for general health and well-being and 86.0% for improved well-being [7]. To date, few studies have reported on the relationship between CAM use and quality of life, and no study has reported on the dietary supplement use and quality of life association in adult cancer patients. The goal of this investigation, which builds upon our prior work in this area [9], was to evaluate whether the use of dietary supplements in the past month was associated with an improved quality of life at the time of admission for cancer treatment.

## Patients and methods

### Study population and procedures

The study was conducted on a convenience sample of new cancer patients who presented for the first time to Cancer Treatment Centers of America at Midwestern Regional Medical Center, Zion, IL, between November 2001 and October 2003. Subjects enrolled in the study were at least 18 years old, had a minimum life expectancy of 2 months, and were literate in the English language. Patients with any tumor type and stage of the disease were eligible for the study. Patients were excluded if they were unable to give informed consent or were unable to understand or cooperate with study conditions. A trained clinical coordinator described the study and determined eligibility after patients signed in at the clinic. As part of the consent process, patients were assured that refusal to participate in the study would not affect their future care in any way. Eligible patients were presented with the questionnaires at their initial visit and returned their completed questionnaires to the clinical coordinator within 24 h. The study was approved by the Institutional Review Board at Midwestern Regional Medical Center.

### Questionnaires

A self-administered questionnaire developed and validated at the University of Washington-School of Pharmacy was used to collect information on (1) each subject's use of dietary supplements within the preceding 30 days, (2) doses of dietary supplements, (3) providers sought, (4) rationale for use, and (5) perceived benefits of use [9, 11]. Fifty six dietary supplements were listed within the questionnaire, along with space for other supplements not listed [9]. The questionnaire also gathered relevant demographic and clinical data, such as age, gender, ethnicity, education, family income, and treatment history. The patients' quality of life was measured with two validated instruments: The European Organization for Research Treatment of Cancer–Quality of Life Questionnaire (EORTC-QLQ-C30) and Ferrans and Powers Quality of Life Index (QLI). The EORTC incorporates five functional scales (physical, role, cognition, emotional, and social), nine symptom scales (fatigue, pain, nausea/vomiting, dyspnea, insomnia, loss of appetite, constipation, diarrhea, financial problems), and a global health status/QoL scale. The possible scores range from 0 to 100. Higher scores in the global and functional scales and lower scores in the symptom scales indicate better quality of life. This instrument is valid, reliable, and sensitive [12–14] and is one of the most common quality of life questionnaires in cancer research. The QLI measures overall quality of life as well as the quality of life in four major scales: health and physical functioning, social and economic, psychological/spiritual, and family. Each scale includes questions on satisfaction as well as personal importance of the domain. Scores are determined by weighting satisfaction responses with importance responses. This weighting adjusts for the influence of individual values and thus produces a more accurate reflection of quality of life. All scores range from 0 to 30, with higher scores indicating a better quality of life. This questionnaire is valid, reliable, and sensitive [15–19] and has been used in many studies involving cancer patients.

### Statistical analyses

SPSS Version 11.5.0 (SPSS Inc., Chicago, IL, USA) and SAS Version 8.02 (SAS Institute Inc., Cary, NC, USA) were used for study analyses. Dietary supplement users were defined as those who had used at least one dietary supplement in the past 1 month. Demographic and clinical predictors of dietary supplement use were evaluated using bivariate  $\chi^2$  tests and *t* tests for independent means depending upon the underlying distribution of the variables. Nonparametric *t* tests were used for continuous variables that were not normally distributed. Demographic and

clinical predictors of QoL scale scores were evaluated using one-way ANOVA for QoL scores that were normally distributed and nonparametric Kruskal–Wallis test for non-normally distributed QoL scores. The association between the use of dietary supplements and QoL was evaluated using multiple linear regression, with QoL score as the outcome variable. Linear regression models were developed for QoL scores that were normally distributed, and Kruskal–Wallis tests were developed for non-normally distributed QoL scores. Variables found to be significantly associated with QoL on univariate analysis were added to the models to control for their confounding effects. Data were then stratified by cancer site, and further parametric and nonparametric models were developed to determine the association of QoL and use of dietary supplements. The alpha level was set at 0.05, and all tests were two-sided.

## Results

### Study population

Recruitment of study participants was between November 2001 and October 2003. A total of 242 cancer patients were approached and screened for eligibility by the clinical study coordinator. All 242 patients were found to be eligible; however, only 227 consented to participate in the dietary supplement survey. Of the 227 who completed the dietary supplement survey, only 225 completed both QoL questionnaires. As a result, the final sample size was 225, for a response rate of 93.0% (225/242).

### Baseline characteristics and dietary supplement use

The majority of subjects in this study were Caucasian females. Sixty seven subjects (29.8%) had breast cancer, 40 (17.8%) had colorectal cancer, 32 (14.2%) had lung cancer, and 86 (38.2%) had other forms of cancer. Table 1 describes the baseline characteristics of our patient cohort in greater details. Of the 225 subjects enrolled in this study, 164 (72.9%) used dietary supplements in the past month, while 61 (27.1%) did not. Of those who used supplements, 76 (46.3%) used five or less supplements, 47 (28.7%) used 6–10, 26 (15.9%) used 11–15, and 15 (9.1%) used more than 15. The most commonly used supplements were vitamin C (46.7%), multivitamin (46.2%), and vitamin E (42.2%) (Table 2). The most common supplement used by colorectal cancer patients was multivitamins (55%); for breast cancer patients, it was vitamin C (47%); and for lung cancer patients, the most common supplements used were multivitamins (50%) and vitamin C (50%).

**Table 1** Baseline characteristics (*N*=225)

Characteristic	Percent
Gender	
Male	40.4
Female	59.6
Education	
<High school	5.8
High school	40.4
College or trade school	38.7
Graduate or professional	12.9
Unknown	2.2
Race	
Caucasian	91.1
Non-Caucasian	8.9
Site of tumor	
Breast	29.8
Colorectal	17.8
Lung	14.2
Others	38.2
Tumor stage at diagnosis	
I	12.4
II	21.3
III	19.1
IV	30.7
Unknown	16.4
Chemotherapy in the last 30 days	
Yes	35.6
No	60.4
Unknown	4.0
Dietary supplement use in the last 30 days	
Users	72.9
Nonusers	27.1

**Table 2** Most commonly used dietary supplements (*N*=225)

Dietary supplement	Percent patients
Vitamin C	46.7
Multiple vitamin	46.2
Vitamin E	42.2
Coenzyme Q10	21.8
Selenium	21.8
Beta carotene	21.8
Vitamin B6	20.9
EPA	20.0
Vitamin B12	19.1
Garlic	18.2
Zinc	16.9
Green tea extract	16.9
Milk thistle	12.0

**Table 3** Mean QoL scores stratified by tumor site

QoL instrument	Lung (n=32)	Colorectal (n=40)	Breast (n=67)	<i>p</i> value
<b>QLI</b>				
Health/functioning	14.1	17.3	16.9	0.12
Social/economic	21.8	22.0	21.4	0.77
Family	24.4	25.3	23.9	0.94
Psychological/ spiritual	20.3	20.8	20.8	0.41
<b>EORTC-QLQ-C30</b>				
Global function	44.3	59.4	56.7	<b>0.02</b>
Physical function	62.3	76.2	75.3	<b>0.02</b>
Role function	40.6	65.8	60.2	<b>0.01</b>
Emotional function	52.1	71.3	62.4	<b>0.01</b>
Cognitive function	66.7	77.1	70.6	0.27
Social function	50.5	62.9	55.2	0.24
Fatigue	58.9	41.1	43.4	<b>0.01</b>
Nausea	16.1	10.8	10.4	0.40
Pain	51.6	31.7	34.3	<b>0.01</b>
Dyspnea	49.0	21.7	24.9	<b>0.00</b>
Insomnia	51.0	32.5	44.8	0.07
Appetite loss	43.8	24.2	29.4	0.06
Constipation	26.0	15.8	18.4	0.30
Diarrhea	11.5	18.3	10.9	0.30
Financial problems	40.6	40.0	36.8	0.84

## Univariate analysis

Subjects were divided into dietary supplement users (72.9%) and nonusers (27.1%) based on use of at least one dietary supplement within the previous month. Using bivariate  $\chi^2$  analysis, statistically significant differences were noted between dietary supplement users and nonusers with regard to education and tumor stage; a detailed description of these analyses is described in our previous publication [9]. Quality of life was not found to be associated with age, gender, race, education, income, or stage at diagnosis. However, several EORTC QoL scale scores were determined to be significantly different based on location of tumor. Patients with colorectal cancer appeared to have the best quality of life and patients with lung cancer the worst (Table 3).

## Multivariate analysis

The mean QLI and EORTC QoL scale scores were compared between the dietary supplement users and nonusers. The results of the QLI comparisons adjusting for tumor site demonstrated a statistically significantly lower family scale score in users of dietary supplements (Table 4), indicating a poorer family QoL. No other QLI scales demonstrated statistically significant differences between users and nonusers of dietary supplements. The results of the EORTC comparisons demonstrated significantly higher

**Table 4** Relationship between dietary supplement use and Quality of Life after adjusting for tumor site

QoL instrument	Nonusers (n=61)	Users (n=164)	Unadjusted <i>p</i> value	Adjusted <i>p</i> value
<b>QLI</b>				
Health/functioning	14.1	16.1	0.07	0.11
Social/economic	21.5	21.1	0.52	0.58
Family	25.2	23.6	<b>0.04</b>	<b>0.04</b>
Psychological/spiritual	28.9	20.3	0.16	0.14
<b>EORTC-QLQ-C30</b>				
Global function	47.4	53.5	0.11	0.23
Physical function	63.3	75.1	<b>0.001</b>	<b>0.01</b>
Role function	48.6	59.6	0.06	0.13
Emotional function	52.9	63.0	0.24	<b>0.03</b>
Cognitive function	68.3	72.0	0.16	0.49
Social function	47.0	55.9	0.32	0.09
Fatigue	57.1	42.9	0.07	<b>0.001</b>
Nausea	22.4	12.4	0.18	<b>0.01</b>
Pain	46.5	35.4	0.36	0.06
Dyspnea	32.8	23.6	0.15	0.25
Insomnia	50.3	42.1	0.24	0.23
Appetite loss	47.5	25.8	<b>0.001</b>	<b>0.001</b>
Constipation	29.0	17.9	<b>0.02</b>	<b>0.02</b>
Diarrhea	15.9	10.8	0.20	0.11
Financial problems	47.5	37.0	0.23	<b>0.04</b>

(better) physical and emotional scale scores in the user group when adjusted for tumor site (Table 4). No other EORTC function scale demonstrated a statistically significant difference between the two groups. The EORTC symptom scales demonstrated lower (better) scale scores in the user group for fatigue, nausea, appetite loss, constipation, and financial problems scales. QoL scores were then stratified by tumor site, and the QoL scores were again compared among users and nonusers of dietary supplements (Table 5). In this stratified analysis, lung cancer patients did not show any statistically significant differences in QoL scores between the users and nonusers. Colorectal cancer patients demonstrated statistically significant differences in constipation symptom, with dietary supplement users having better QoL. Breast cancer patients demonstrated statistically significant differences in several QoL scale scores between users and nonusers. Breast cancer patients who took dietary supplements were found to have higher QoL scores in QLI health/functioning and psychological/spiritual scales and in EORTC global and physical function scales, indicating

better QoL in breast cancer patients who used dietary supplements.

## Discussion

Quality of life is one of the most common self-reported reasons for using CAM. This study is the first to assess the use of dietary supplements (a specific form of CAM) and its relationship with quality of life using standardized QoL questionnaires in adult cancer patients. We found a better QoL in the users of dietary supplements when compared to the nonusers for several EORTC QoL scales after controlling for tumor site. These results are not consistent with those reported by other researchers in the field where QoL scores were found to be worse in CAM-using cancer patients [20–22]. Cassileth et al. (1991) assessed change of QoL over time with global CAM use and demonstrated that QoL was significantly poorer among new CAM users [21]. Burstein et al. (1999) prospectively followed women with newly diagnosed early-stage breast cancer and found

**Table 5** Relationship between dietary supplement use and Quality of Life stratified by tumor site

QoL instrument	Lung			Breast			Colon			Others		
	Nonuser (n=15)	User (n=17)	<i>p</i> value	Nonuser (n=17)	User (n=50)	<i>p</i> value	Nonuser (n=8)	User (n=32)	<i>p</i> value	Nonuser (n=21)	User (n=65)	<i>p</i> value
QLI												
Health/functioning	14.1	14.1	0.99	13.6	18.0	<b>0.03</b>	17.7	17.2	0.87	13.2	14.5	0.43
Social/economic	21.7	21.9	0.93	21.3	21.5	0.83	21.2	22.2	0.59	21.6	20.2	0.12
Family	24.4	24.5	0.96	25.8	23.3	0.08	26.4	25.1	0.50	25.0	23.0	0.12
Psychological/spiritual	21.2	19.5	0.42	17.4	21.9	<b>0.01</b>	20.2	21.0	0.80	18.0	19.0	0.58
EORTC-QLQ-C30												
Global function	37.8	50.0	0.37	50.5	58.8	<b>0.02</b>	61.5	58.9	0.21	46.4	47.7	0.86
Physical function	60.9	63.5	0.78	60.0	80.5	<b>0.01</b>	75.8	76.3	0.52	62.8	73.4	0.12
Role function	33.3	47.1	0.12	54.9	62.0	0.08	66.7	65.6	0.64	47.6	57.9	0.26
Emotional function	42.2	60.8	0.18	53.4	65.5	0.38	61.5	73.7	0.59	56.7	56.3	0.94
Cognitive function	55.6	76.5	0.25	68.6	71.3	0.20	72.9	78.1	0.60	75.4	68.2	0.25
Social function	41.1	58.8	0.38	46.1	58.3	0.15	66.7	62.0	0.29	44.4	50.3	0.49
Fatigue	70.0	49.0	0.37	54.3	39.8	0.27	48.6	39.2	0.10	53.4	45.4	0.30
Nausea	27.8	5.9	0.32	10.8	10.3	0.94	14.6	9.9	0.43	30.9	16.9	0.06
Pain	58.9	45.1	0.48	43.1	31.3	0.74	43.8	28.7	0.28	41.3	39.2	0.81
Dyspnea	53.3	45.1	0.15	37.3	20.7	0.25	16.7	22.9	0.24	20.6	20.5	0.98
Insomnia	60.0	43.1	0.53	49.0	43.3	0.14	58.3	26.0	0.05	41.3	48.7	0.41
Appetite loss	55.6	33.3	0.09	45.1	24.0	0.07	37.5	20.8	0.39	47.6	27.7	<b>0.03</b>
Constipation	35.6	17.7	0.13	25.5	16.0	0.23	45.8	8.3	<b>0.01</b>	20.6	24.1	0.64
Diarrhea	15.6	7.8	0.54	17.7	8.7	0.37	20.8	17.7	0.64	12.6	9.7	0.56
Financial problems	46.7	35.3	0.36	47.1	33.3	0.57	45.8	38.5	0.50	49.2	39.5	0.28

that new use of alternative medicine was common in women with lower quality of life, with new use being independently associated with depression, fear of recurrence of cancer, lower scores for mental health and sexual satisfaction, and more physical symptoms as well as symptoms of greater intensity [20]. A more recent cross-sectional study demonstrated that functional quality of life (including physical, emotional, social, and role function) and symptom (fatigue and diarrhea) scores were significantly worse for recent complementary therapy users compared with nonusers [22]. Consistent with the findings of these studies, we found a better QLI family scale score in the nonusers as compared to the users of dietary supplements. However, this difference, although statistically significant, is not considered to be clinically meaningful [16]. A difference of 2–3 points in the QLI scores has been associated with significant improvement in overall quality of life in studies assessing change in quality of life [23, 24]. It is worth noting that previous studies differ from the present study with regard to the definition of CAM, with the present study specifically assessing the use of dietary supplements. The definition of CAM varies considerably from study to study, a problem common within the CAM literature [25–28].

We also found that patients with colorectal and breast cancer had statistically significantly better QoL as compared to those with lung cancer. Consistent with other studies [1, 2, 5, 22, 29] in the literature, we found an increasing dietary supplement use with higher education. In addition, we found that patients with stage II and stage III disease at diagnosis are more likely to use dietary supplements as compared to those with stage I disease at diagnosis.

Our study has several strengths. A high response rate of 93% minimizes response bias, a significant problem in CAM survey research. The CAM questionnaire used in this study evaluated dietary supplement use restricted to the preceding 30 days only, thereby minimizing recall bias. However, several limitations of this study require careful

acknowledgment and have been discussed in our previous paper [9]. The patient cohort was limited to only those patients who were English-speakers and consisted largely of Caucasians with breast cancer. This study sample, therefore, is not broadly representative of cancer patients in general. Our hospital offers a wide range of integrative cancer treatment options including nutritional, naturopathic, mind body medicine, and spiritual therapies in conjunction with conventional cancer care. It seems likely that many patients seeking care at our hospital tend to view dietary supplements as beneficial and thus are more likely to report better quality of life while taking supplements. The cross-sectional nature of this study limits making any causal inferences regarding the dietary supplement use and QoL. Due to missing data on tumor stage for 37 patients, the association of tumor stage with dietary supplement use was based on a sample size of 188 only. Finally, our sample size might not have been large enough to accommodate the number of comparisons made within this study.

Quality of life is an important aspect of cancer patients' lives. Research into maintaining or improving QoL outcomes continues to be needed. This study demonstrated that dietary supplement use is associated with a better QoL in cancer patients. The next step in this research is to prospectively evaluate the patterns of changing QoL in relation to dietary supplement use across the entire duration of cancer diagnosis and treatment. Future studies should also evaluate whether QoL in cancer patients is higher in life-long users of dietary supplements vs new users who began using supplements after the cancer diagnosis.

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